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LASSA FEVER IMMUNE PLASMA

ANNUAL/FINAL REPORT

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During the life of Contract DAMD17-85-C-5189 870 units of Lassa Fever Immune Plasma (LFIP) were obtained by plasmapheresis; 482 units were forwarded to the US Army Medical Research Institute of Infectious Diseases (USAMRIID). Because of a breakdown in communications accompanying an insurgency in that country, no information about plasmapheresis in late 1989 and early 1990 is available.

Before June 1989, Lassa fever (LF) was diagnosed in 198 patients with fever, 144 by virus isolation, at the Curran Lutheran Hospital (CLH) and Phebe Hospital (PH) in Liberia. Possible Lassa Fever (PLF) was diagnosed in another 38 patients in these hospitals because of high-titer Lassa virus antibody levels in patients with single serum specimens. One case of LF and two of PLF were found in patients in three other smaller hospitals.

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19. Abstract

Passive immunotherapy was used in 164 patients with complete identification. Of 98 in whom laboratory testing was done, the diagnosis of LF or PLF was confirmed in 48 or 49%. Of 15 patients in whom both IFA testing and attempts at virus isolation were done, in 10 or 67% the clinical diagnosis was confirmed.

The potency of LFIP units as measured by the Log Neutralization Index (LNI) was known in only one-fourth the plasma units administered. Thus, no comparison of high and low potency LFIP units could be made.

In the absence of complete laboratory testing of patients, and of regular determination of levels of viremia during the treatment of LF, and of the LNI's in the LFIP units, the goal of this program, a controlled study of the efficacy of LFIP in the treatment of LF, was not attained. A further obstacle to the program in its last six months was the outbreak of an insurgency in Liberia with an attendant breakdown in communications with the hospitals.

Summary

The aim of research under contract DAMD17-85-C-5189 was to conduct a controlled trial of Lassa Fever Immune Plasma (LFIP) in the treatment of Lassa Fever (LF). Patients were to be randomly assigned to receive LFIP units of either high or low Log Neutralization Index (LNI) from a list of LFIP units coded by the Principal Investigator. Sera obtained before and during treatment were to be subjected to virus isolation; the criterion for determining the success of LFIP admnistration would be the effect upon virus titers.

Plasmapheresis to obtain LFIP units was performed at Curran Lutheran Hospital (CLH) and Phebe Hospital (PH). Because of an insurgency in Liberia during the last year of the Contract information regarding the total number of units was incomplete. At least LFIP 840 units were obtained and at least 482 forwarded to the United States Army Medical Research Institute of Infectious Diseases (USAMRIID).

The diagnosis of LF was made by isolation of Lassa virus (LV) from early serum specimens, or by seroconversion or four-fold rise in titer of LV antibody in paired patient sera tested by the indirect fluorescent antibody (IFA) technique. Possible LF (PLF) was diagnosed in unpaired single specimens with a high IFA titer of 1:64 or more. Of 587 patients with fever at CLH tested for LF, 86 were found to have LF, 53 by virus isolation and 33 by serodiagnosis; 18 others were diagnosed as having possible LF. At PH, 700 patients were tested and 112 diagnosed to have LF, 91 by virus isolation. 20 more patients were considered to have PLF. The markedly increased number of LF patients at PH in the last three years reflected an outbreak of LF in its catchment area. Of 27 patients tested in three other small hospitals, one was found to have LF by serodiagnosis, and two, PLF.

Passive immunotherapy with LFIP was used in many patients, especially at PH. Among 164 patients with clinical LF and with complete identification, 98 were tested by the IFA technique or virus isolation; of these, 48 or 49% were confirmed to have LF or PLF. Of 13 patients in whom both techniques were used, in nine or 70% the diagnosis was confirmed. Thirty two patient records were received in whom identification was incomplete, and there were a number of patients treated at CLH whose records are still in Africa. It is estimated that if both laboratory techniques had been used in all patients, about 110 of all patients with records received from the hospitals would have been laboratory confirmed LF suitable for analysis. Some records of patients treated during the last year of the project could not be reviewed because the civil disturbances in Liberia interrupted communication with the hospitals.

Most LFIP units were not tested for the LNI of virus antibody, and virus isolation to monitor the degree of viremia before and during treatment could not be done.

The Field Investigator and Resident Head of the Program, Mr. J.E. Yalley-Ogunro, evaluated the enzyme-linked immunosorbent assay (ELISA) previously developed at USAMRIID, and found it not reliable in the field.

Site visits were made by personnel of USAMRIID, in April 1988 by Dr. Peter B. Jahrling and in early 1990 by Dr. Eugene Johnston. Mr. Yalley-Ogunro Field Investigator, emigrated from Liberia to the United States in July, 1988, and Dr. Andrew K. Cole, the Clinical Investigator, then became resident head of the program in Liberia.

Foreword

For the protection of human subjects the investigators have adhered to policies of applicable Federal Law 45CFR46.

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I. Statement of the Problem

Lassa fever (LF) was first identified in the investigation of nosocomial febrile outbreaks in West Africa (1,2,3,4) and subsequently found to be widespread throughout the region (5). Treatment has essentially been supportive. In spite of anecdotal reports of dramatic and rapid responses in some patients to the use of Lassa Fever Immune Plasma (LFIP), in the absence of controlled studies the efficacy of immunotherapy must be considered unproved (6,7,8).

Controlled, prospective investigations are needed to determine whether LFIP or its derivative, LF Immune Globulin (LFIG) is indeed able to control or at least modify the course of LF in humans.

Ribavirin has been reported effective in the treatment of Lassa virus (LV) infections in primates (9). It is important that this modality also be evaluated in controlled experiments with patients.

II. Background

An outbreak of LF in the Curran Lutheran Hospital (CLH) in Zorzor in 1972 demonstrated its presence in Liberia (3). A pilot study conducted in Liberia from 1976 to 1979 revealed high prevalences of LV antibodies (LVA) in members of hospital staffs in Liberia, and indicated the feasibility of working with Liberian hospitals in further investigations of LF in that country (10). It also persuaded the Republic of Liberia to agree to ongoing research in LF. On the basis of these preliminary findings a joint program to procure LFIP and to study the epidemiology of LF was entered upon by Columbia University (CU), the Liberian Institute for Biomedical Research (LIBR) and the United States Army Medical Research Institute of Infectious Diseases (USAMRIID) under Contract No. DAMD17-79--C-9024 awarded by the U.S. Army Medical Research and Development Command (USAMRDC).

Under the contract 589 LFIP units were obtained of which 317 were forwarded to USAMRIID, and 272 accepted there with what appeared to be useful antibody titers, measured by a Log Neutralization Index (LNI) of 0.3 or higher. Testing of 1846 febrile patients at CLH, Phebe Hospital (PH) and G.W. Harley Memorial Hospital (GWH) resulted in the diagnosis of 213 cases of LF, 139 by virus isolation and 74 by seroconversion, and of 71 cases of Presumptive LF on the basis of high LF antibody titers in single specimens (11).

Investigation of the virus isolates at USAMRIID revealed two and possibly three LV serotypes, associated with varying degrees of morbidity and mortality among laboratory animals (12).

Other results of the investigation included the finding by serological surveys of hospital staffs of the presence of LV activity in all parts of Liberia, with the highest prevalence of antibodies in the north and west (13). It was also found by serological surveys that the prevalance of LV antibodies was higher in villages along the highway than in comparable villages "in the bush" (14). The prevalence of LVA in hospital staffs was from two to four times that in the nearby villages; this suggested that the hospital workers acquired infection from their patients as well as in their communities (14). At CLH two independent studies indicated an annual LF incidence of 0.03 among hospital staff members (11).

On the other hand, the results of studies of immunotherapy were not definitive. Though the case fatality of LF patients treated with LFIP was lower than that of the untreated patients, it was not significantly so (11). The use of LF was not randomly controlled, and it is likely that the more seriously ill patients were those to receive LFIP.

III. Approach to the problem

The goal of this investigation was the use of LFIP in a formal controlled blind study of its efficacy in the managcment of LF. It was initially planned to test ribavirin as well, but eventually it was decided to limit the study to immunotherapy. It was also decided to determine the efficacy of treatment by changes in viremia rather than clinical recovery; it was believed that in some cases the treatment might effectively control the virus even though the damage already done before institution of treatment might make the patient's recovery impossible.

Because of ethical considerations, the use of LVA-negative plasma for controls was deemed inappropriate. Rather, plasma recipients would receive either high potency or low potency LFIP, as determined by the LNI, from a coded list of LFIP units supplied by the Principal Investigator, who would earlier divide them into two groups of high and low LNI units. The unit infused into a patient would be selected by recourse to a list of random numbers.

If a trial of LFIG were to be made, as suggested during the course of this study, it would be necessary to prepare the immune globulin from LFIP in a form suitable for intravenous use. It would also be necessary to obtain approval of the Food and Drug Administration, which was concerned with the safety of the LFIG as well as with the investigational protocol.

Potential patients to be treated were to be selected by the hospital initially on the basis of clinical criteria. Hospital staff physicians and nurses were familiar with the criteria for the clinical diagnosis of LF, and this information was was to be reviewed with them periodically. If a case of LF were suspected, serological testing was to be done, using the IFA technique for the

identification of IgM antibodies. If the ELISA technique were found reliable, the LF antigen capture LVA IgM technique would be employed.

A patient would be administered an infusion of two units of LFIP from one or the other of the groups of plasma, the choice determined from a table of random numbers. Serum specimens would be obtained from a patient before and after plasma infusion, and forwarded to USAMRIID for virus isolation. If the patient did not respond clinically to the initial plasma infusion within two days, LFIP from the other group of plasma would be administered, and more sera for virus isolation obtained.

In accordance with practices which by now had become familiar to hospital and research staff in Liberia, potential donors of LFIP would be identified by the diagnosis of LF among patients with fever entering the hospitals. A patient in whose case virus isolation was successful was particularly desired, but because of the long interval between the illness and the return of laboratory reports from USAMRIID, most donors would be selected initially on the basis of serodiagnosis.

IV. General narrative

The Field Investigator, Mr. J. E. Yalley-Ogunro, made frequent trips to the Field Stations at CLH and PH to conduct plasmapheresis, obtain rosters of serological specimens as well as the specimens themselves, obtain clinical records of patients treated for LF and confer with staff physicians and the laboratories about the status of the work at their sites. Upon his return to the LIBR at Robertsfield he conducted serological tests of patient sera. From time to time he shipped plasma units and patient sera to the Principal Investigator in the United States, who in turn forwarded them to USAMRIID. During most of this period specimens and plasma were forwarded to the United States by means of the facilities of the VILAB II laboratory of the New York Blood Center.

In Early October, 1986, Mr. Yalley-Ogunro began a five-month stint at USAMRIID in order to learn virus isolation, to prepare antigen slides for the IFA test, and become familiar with the antigen capture and the IgM antibody ELISA tests. It was expected that this would prepare him further for the new phase of research.

He returned to Liberia in April, 1987, continuing his duties as before. In addition, he field-tested the ELISA technique he had learned at USAMRIID on sera of known status stored at the LIBR. Though he found the ELISA antigen capture test to be unreliable, he did instruct laboratory personnel at CLH and PH in the ELISA technique, looking to the time that a more satisfactory ELISA system for use in the field could be developed at USAMRIID.

In July, 1988, Mr. Yalley-Ogunro emigrated to the United

States. He planned to return to Liberia periodically to supervise plasmapheresis, and to monitor the investigations of treatment which were scheduled. However, problems in obtaining an appropriate American visa made this plan impossible.

He had hoped to be engaged in LV research at USAMRIID, and indeed for a year worked at virus isolation there. However, it was not possible to obtain funding for his continued investigation of LF at USAMRIID, and he was employed on another program.

The Clinical Investigator, Dr. Andrew Cole, is Director of the hospital in Kolahun (KH) the center of a district about one hundred miles northeast of CLH in Zorzor. Earlier investigations have shown this to be an area with a high incidence of LV infections, and Dr. Cole has been trying to encourage primary health care workers to make the clinical diagnosis of LF, and refer patients to medical centers for treatment. He advised physicians at PH in strengthening the LF program there. Upon Mr. Yalley-Ogunro's departure in mid-1988, Dr. Cole became the Resident Head of the LFIP program. He assisted in administrative changes that became necessary in the program at PH, and regularly visited the field stations at PH and CLH. He consulted with Dr. Aloysius P. Hanson, Director of the LIBR, and with Ms. Betsy Brotman of VILAB II, arranging that she visit CLH to instruct the laboratory personnel there in the use of the fluorescence microscope. In spite of the risk in Liberia after the insurgency began in early 1990 he continued there until the end of June, 1990. He traveled to the coast through "bush" roads, as the main highways were being disputed by the contending forces, and left through Sierra Leone.

Dr. Mark Monson continued his responsibilities as Director of CLH. Though he is not supported by this program, as before he was a stalwart resource for the diagnosis and treatment of LF at that institution. He remained in Liberia until early August, 1990, leaving at that time through Guinea.

Dr. Peter Jahrling of USAMRIID visited Liberia in April 1988 to evaluate the status of the program and potentials for further research there. His trip took him to PH, GWH, CLH, KH, and to Foya where LF has been most common, and he conferred as well with Dr. Hanson, Director of the LIBR.

Dr. Eugene Johnston of USAMRIID made site visits to CLH, PH and the LIBR in February, 1990. He discussed future work with Dr. Cole, Dr. Monson, with the physicians at PH, and with Dr. Hanson at the LIBR, and explored other resources in Liberia as well. Unfortunately, soon after his visit the political situation in Liberia made it impossible to capitalize on his suggestions.

The Principal Investigator, Dr. John D. Frame of CU, visited Liberia twice a year through the autumn of 1989; because of the uncertain political and civil status of the country he did not return in the spring of 1990. During his visits to CLH, PH and KH

he instructed health personnel in recent developments in LF research, reviewing and, if necessary, correcting techniques being used in the laboratories. He became aware in 1987 of the increase of LF patients at PH, and determined that a high proportion were coming to that center from Ganta in Nimba County; he traveled on several occasions to GWH in Ganta to see what assistance could be given them in making the diagnosis of LF. Plans to increase the capabality of this hospital in the management of LF were interrupted by the insurgency in Liberia which was initiated by an invasion of a small rebel force into Nimba County, in which Ganta is located.

On the suggestion of Dr. Jahrling it was determined by late 1989 to use liquid nitrogen refrigerators for the preservation and shipment of patient sera in order to assure maximum preservation of viral activity. Cryogenic equipment was purchased and the first liquid nitrogen freezer sent to Liberia in March, 1990. The original plan, to compare high and low LNI plasma in treatment, could not be carried out as information regarding the LNI of LFIP units obtained in the last two years was not available from USAMRIID. It was decided that aliquots of LFIP units used in treatment would be forwarded with the patient sera, and that eventually the LNI's of the units could be determined at USAMRIID. It was also planned that Mr. David Dorborson, Chief of Laboratory at CLH, who had learned the IFA technique from Ms. Brotman, would test patient sera at PH and CLH in order to supply the physicians early laboratory confirmation of their clinical diagnoses. The influx of suspected LF patients was continuing at PH, ensuring at least a modest number of subjects for investigation.

Dr. Cole discussed this program with all who would be involved in the investigation, and arranged for appropriate coordination with the hospitals and with VILAB II at LIBR, which was to receive the liquid nitrogen freezers from the United States, and ship specimens to the United States. Unfortunately, this plan was thwarted by the civil strife. Though the insurgency was at first limited to Nimba County, the actions of the troops of the Liberian government fed the discontent to the extent that by the spring of 1990 the roads between Monrovia and the field sites became dangerous. The retreating government troops sacked GWH in Ganta, Nimba County, and their resistance to the insurgency collapsed.

V. Results

A. Plasmapheresis

In the summer of 1985 it was expected that Mr. Yalley-Ogunro would return to Liberia periodically to conduct plasmapheresis. When it became apparent that he could not, plasmapheresis was conducted by the laboratory personnel at CLH and PH. Through June, 1989, 85 convalescents from LF donated at least 870 units of LFIP. Of these, at least 482 units were forwarded to USAMRIID through June, 1988 (Table 1). Because of the breakdown of all communication

with the Liberian sites, it has not been possible to obtain from them field records of more recent plasmaphereses nor of their shipments. Plasmapheresis was in fact continuing at least to the end of 1989. Further shipments of plasma were made to USAMRIID, 37 in January 1990. USAMRIID has not supplied information regarding what plasma specimens have been received there since June, 1988, nor their potency as measured by the LNI.

It has been demonstrated, as with the previous Contract, that Liberians are willing to contribute to plasmapheresis. Table 2 indicates the number of units received from the various donors through June, 1989.

B. Hospital surveys of febrile patients

The diagnosis of cases of LF among febrile patients in the hospitals determines the population to be subjected to treatment. It also identifies potential plasma donors.

Both serological and virological techniques are used in diagnosis. Serodiagnosis depends upon seroconversion, or a four-fold rise in the LV antibody titers in serial specimens; in this investigation the IFA technique was used. In some cases the initial specimen was obtained late in the course of the disease, when antibody titers were already high, and subsequent specimens showed no significant rise in titer. In others, only one specimen was obtained, and comparison of the titers between specimens was not possible. If there was no change in a high titer, or if a single specimen only was obtained and the IFA titer was 1:64 or higher, the patient was classified as Possible LF (PLF).

Serodiagnosis required the sending of specimens to the LIBR where the fluorescence microscope was available. Thus, the laboratory diagnosis was established retrospectively. As noted above, it was hoped that the use of ELISA antigen capture tests, or ELISA testing for IgM antibody might prove practical. The technique would then have been made available to the hospital laboratories, and the laboratory diagnosis of LF would have been available to the physicians within a matter of hours following admission of a patient. Because of the failure of the ELISA technique under field conditions this could not be done.

We have demonstrated earlier that when virus isolation is performed the diagnosis of LF may be made in patients among whom it is missed by serodiagnosis (11);for example, many cases diagnosed serologically as PLF have been recognized to be LF when viremia was demonstrated. Conversely, virus isolation may not be possible if the specimen is obtained after the viremic phase, or if refrigeration is inadequate to maintain virus activity from the time serum is obtained until it reaches the virological laboratory at USAMRIID. Because of limitations of time of the staff at USAMRIID, virus isolation was not attempted on about one-third the specimens submitted.

No serological testing was performed after Mr. Yalley-Ogunro's departure from Liberia, July, 1988. The supply of slides to be used with the IFA technique was exhausted, and he planned to prepare slides at USAMRIID which he could use when he returned periodically to Liberia. As noted above, he was unable to carry out his planned Liberian visits. He did prepare slides in the spring of 1989, and these were sent to Liberia.

Working at USAMRIID Mr. Yalley-Ogunrohe was able to carry out virus isolation, not only from specimens of patients seen during the year he was there, but also on a backlog of specimens of patients treated earlier but tested only by serodiagnosis.

Five hundred eighty seven febrile patients were tested at CLH (Table 3). Lassa fever was diagnosed in 86 patients and PLF in another 18. LV was isolated from 53 patients at CLH, 12.3% of the 424 cases in which it was attempted.

At Ph 700 febrile patients were tested, with LF diagnosed in 112 and PLF in another 20 (Table 4). LV was isolated in 91 or 23% of the 398 patients in whom isolation was attempted.

Phebe Hospital had been incorporated into the LF research program in Liberia on the basis of the earlier finding of a high proportion of LF cases among its fever patients. In general, the incidence of LF in PH appeared to be lower than that in CLH for a number of years. In 1987 the physicians at PH noted an increase in the number of LF patients diagnosed clinically, and a review of Table 4 demonstrates that the number of cases as well as the incidence among fever patients has indeed risen in the past three years; almost one-half of all isolations of LV during the term of this Contract were made from patients seen at PH between December, 1987 and February, 1989, over one fourth in last nine months of testing.

During this period, early in 1988, two surgeons of the PH staff acquired LF, apparently from patients. Both were administered LFIP and both recovered without sequelae.

No attempt has been made at USARMIID to determine whether this outbreeak in Phebe catchment area is due to a viral serotype already found in Liberia, or whether it may be a more virulent type than those hitherto studied.

Sporadic testing of patients at the ELWA hospital, located on the coast about 10 miles east of Morovia, has been carried out from time to time. For the first time the diagnosis of LF was made by serodiagnosis on one patient there. It is not clear whether the patient was a resident of the area, or had come to ELWA from "up-country" because of its high medical reputation (Table 5).

A diagnosis of PLF was made on a patient from Kolahun, in Lofa County near the Sierra Leone border; only one specimen was

submitted. Similarly, PLF was diagnosed because of high LVA titer in a patient at GWH in Ganta. It is noted that most suspected LF patients in Ganta are referred to PH, 45 miles away by paved highway; indeed, it appears that a large proportion of the LF patients treated in PH in the last three years are from the environs of GWH in Ganta.

C. Passive immunotherapy

Treatment of clinically diagnosed LF patients with LFIP has continued; it is now considered to be standard treatment at PH when LF is diagnosed in a febrile patient. In fact, most of the LFIP units obtained in the last three years by plasmapheresis at PH have been used in the current outbreak there. Table 6 lists the patients treated at CLH and PH whose records are fairly complete and available at this time.

Of the 164 patients listed, 98 were tested by laboratory techniques and of these, 48 or 49% diagnosed as LF or PLF in confirmation of the clinical opinion (Table 7). The Table indicates the relative usefulness of the various techniques in supporting the clinical diagnosis of LF. Lassa virus was isolated from sera of 41 patients of the 70 in whom isolation was tried. Of 43 patients tested by the IFA technique, 11 or one-fourth met serological criteria for LF or PLF. When both serological and virological techniques were used, the clinical diagnosis was confirmed in 67% of instances, a measure of the acumen of the hospital staffs.

The LNI's, the measure of antiviral potency, are known for about one-fourth the LFIP units used. In some instances LFIP units were used from donors whose earlier plasma donations were of known potency, but with the lapse of time since testing was last performed the LNI of recent plasma is conjectural. Even when LNI's are known a degree of uncertainty persists. USAMRIID tests only units which have been submitted to it, and the LNI of LFIP units retained in the field are known only approximately. Though aliquots of these units are regularly sent to USAMRIID, they are not tested. Another confounding factor is that at PH with the flood of patients treated in the last two years LFIP units were used from donors who had previous diagnoses of LF, but whose LNI's were never determined.

Records have also been received of patients whose identification is incomplete, 32 from PH and two from CLH. Attempts to complete the records have been unsuccessful because of the breakdown of all communications with the hospitals. Dr. Mark Monson has already compiled information of patients treated at CLH, but these records are now in Guinea, where he deposited them when he was forced to travel with minimum baggage as he returned to the United States. Though work at PH continued through early summer, 1990, Dr. Frank Takyi, Director of the LF program in that hospital, did not have sufficient staff to ferret out missing information from earler records in that hospital.

It expected that the CLH records will eventually become available, when Dr. Monson retrieves them. Records from PH may also

become available when communication is restored with that site, if in the meantime they are not destroyed in the fighting in Liberia.

One may project that if complete laboratory diagnostic tests had been performed on the patients treated with immunotherapy on the basis of clinical diagnosis, about 110 cases of confirmed LF would have been available for analysis.

In the absence of up-to-date information on the potency of the plasma as determined by the LNI no rational conclusion of its efficacy can be made. And because of the inability to obtain records from Liberia since the beginning of the insurgency early this year, not even a crude estimate of the value of LFIP administration to recent LF cases there can be made.

D. Enzyme-linked immunosorbent assay

Enzyme-linked immunosorbent assays (ELISA) have been developed for the diagnosis of LF. However, they had not been tested under conditions of the field in Liberia. Upon his return from the United States in 1989 Mr. Yalley-Ogunro began testing ELISA in an antigen-capture technique. He tested the sera of 26 febrile patients, including several specimens from which he subsequently isolated LV. He was unable to demonstrate a consistent diagnostic response. The test is to be re-evaluated at USAMRIID.

VI. Conclusions

The goal of this investigation, the controlled testing of LFIP as treatment for LF, was never attained. Plasma was obtained and patients treated. However, several factors interfered with obtaining objective evidence of the efficacy of LFIP in the treatment of LF.

The goal of using levels of viremia to monitor the effectiveness of treatment was vitiated by the limited amount of virus isolation attempted; the results of what isolation was done were qualitative rather than quantitive. The plan, to compare LFIP units of high and low LNI required determination of LNI of all units, and this, too, was not done.

Factors other than the experimental influenced the course of the investigation. The loss of a key person in the field, the Field Investigator, retarded the course of the investigation, but was being overcome under new leadership. However, the investigation could not overcome the effects of insurgency.

Investigation of the efficacy of LFIP in the treatment of LF is still worth attempting. For a successful investigation, however, laboratory capabilities for regular viremic studies are essential. These should include not only determination of virus titers but also of virus serotypes. The timely determination of the potency of the plasma used will also needed, unless future studies are carried out with LFIG of a relatively consistent degree of antiviral activity.

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VIII. Publications

Monson, HM, Cole, AK, Frame, JD, Serwint, JR, Alexander, S & Jahrling, PB. Pediatric Lassa fever: a review of 33 Liberian cases. Am. J. Trop. Med. Hyg. 36: 408-409 (1987).

Frame, JD Clinical features of Lassa fever in Liberia. Rev. Infect. Dis. 2: (Suppl. 4) S783-S789. (1989)

IX. Personnel receiving contract support

John D. Frame, M.D., Principal Investigator (17%). Clincal Professor of Public Health (Tropical Medicine), Columbia University School of Public Health, New York, N.Y.

Sylvia Terilli, (20%), Executive Secretary, Division of Tropical Medicine, Columbia University School of Public Health.

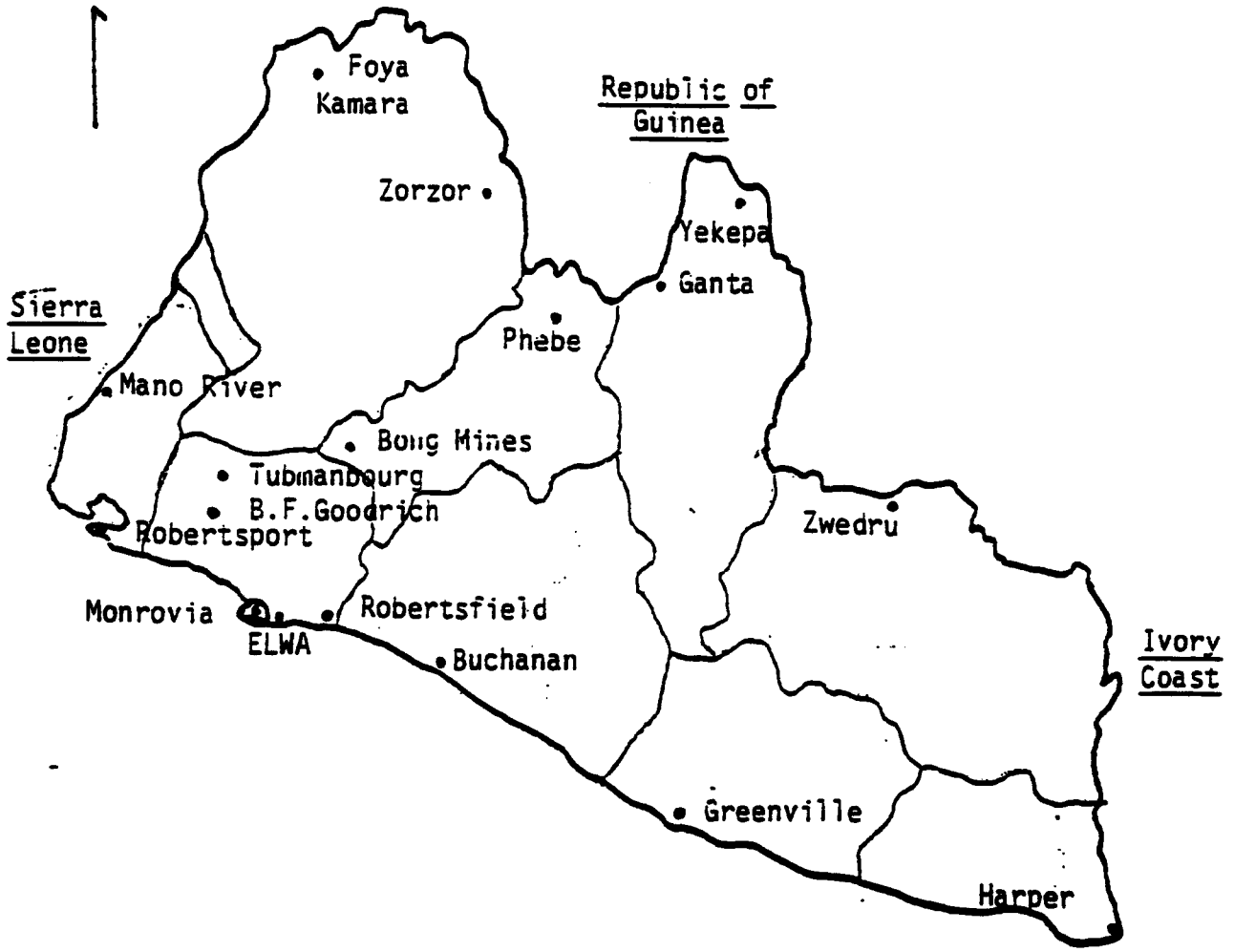
J.E. Yalley-Ogunro, B.S. (100% through July, 1989), Field Investigator; Resident Head, Lassa Fever Control Project, Liberian Institute for Biomedical Research, Charlesville, Liberia.

Andrew K. Cole, M.D. (50%), Clinical Investigator, Lassa Field Control Project, Kolahun Hospital, Kolahun, Lofa County, Liberia.

James Norman, B.S.. (50% through November, 1988), Laboratory Technologist, Lassa Field Control Project, Phebe Hospital, Bong County, Liberia.

None of the above received support toward the earning of a graduate degree as a result of research done under this Contract.

LIBERIA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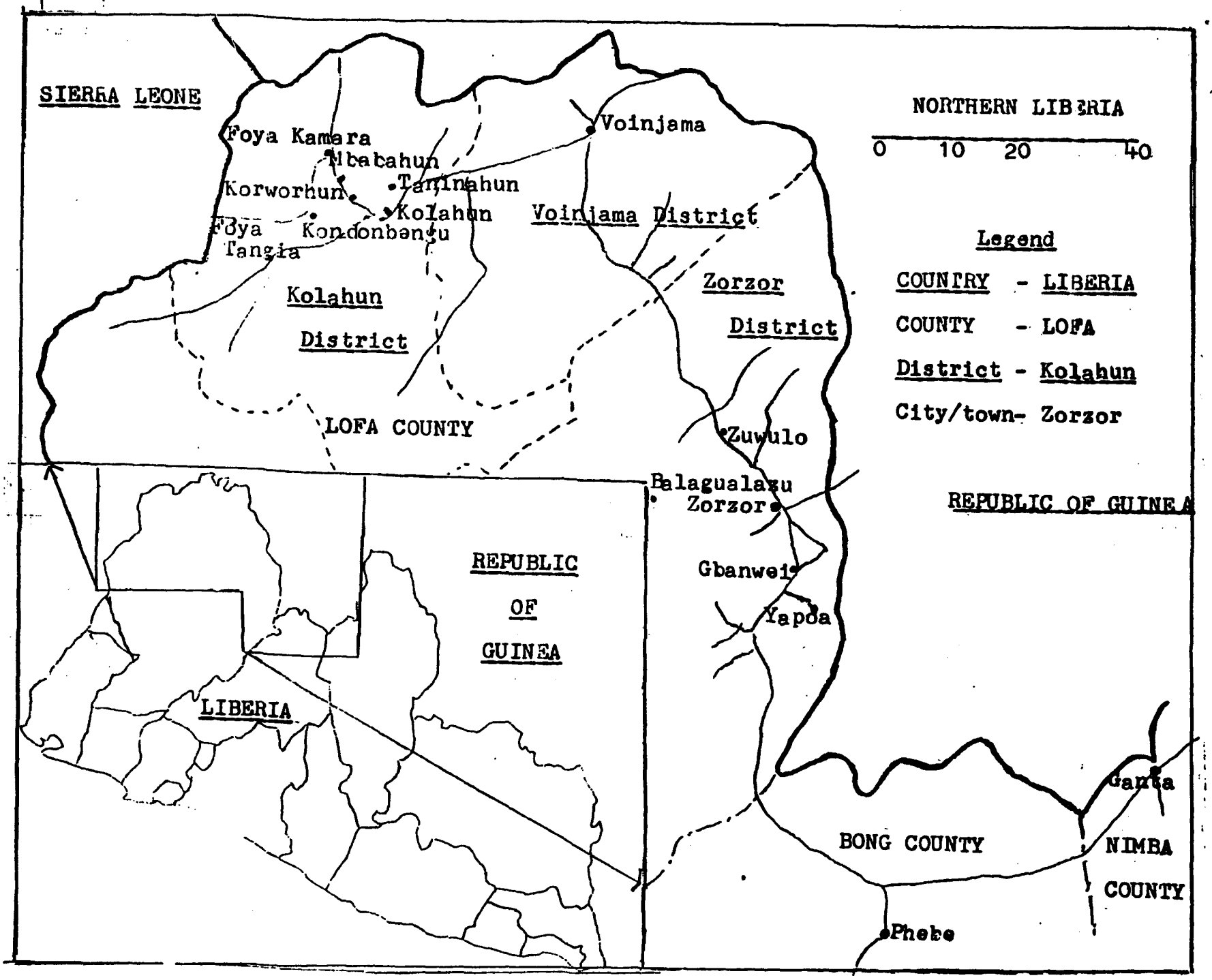
SIERRA LEONE
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Ibabahun
Tamnahun
Korworhun
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Voinjama
Voinjama District
Foya Kondonbangu
Tangia
Legend
COUNTRY - LIBERIA
COUNTY - LOFA
District - Kolahun
City/town- Zorzor
Kolahun District
Zorzor District
LOFA COUNTY
Zuwulo
Balagualazu
Zorzor
REPUBLIC OF GUINEA
REPUBLIC OF GUINEA
Gbanwei
Yapda
LIBERIA
Ganta
BONG COUNTY
NIMBA COUNTY
Phebe

TABLES

Table 1. Number of LFIP units obtained by plasmapheresis in Liberian hospitals, and number of units forwarded to USAMRIID, by year.

Year	Units Obtained	Units to USAMRIID
1985-86	254	189
1986-87	153	83
1987-88	358	180
1988-89	103*	Unknown#
1989-90	Unknown@	37
Total known	870	482

* Incomplete--Curran Lutheran Hospital did not send documents for the latter months.
\# No information from USAMRIID regarding LFIP units received.
@ Documents not available--civil disorder in Liberia.

Table. 2. Number of LFIP units donated per donor.

Number of LFIP units per donor	Number of donors	Total LFIP units
1 - 4	35	92
5 - 8	12	83
9 - 12	7	80
13 - 16	8	121
17 - 20	9	190
21 - 24	12	246
25 - 28	1	28
30	1	30
Total	85	870

Table. 3. Results of testing febrile patients at Curran Lutheran Hospital, Liberia, for evidence of LV infections, July, 1985 to April, 1989.

Hospital/ Dates	No. tested	Lassa Fever			Possible LF (High IFA titers	Total LF & possible LF (Rate)	Other IFA pos.
		Virus isolation	Seroconversion	Total (Rate)			
7/1/85-11/30/85	73	13	4	17 (0.23)	-	17 (0.23)	5
12/1/85-4/30/86	47	7	4	11 (0.23)	5	16 (0.34)	1
5/1/86-9/20/86	52	6	3	9 (0.17)	-	9 (0.17)	
10/1/86-12/31/86	23	*	3	3 (0.13)	-	3 (0.13)	
1/1/87-11/30/87	140	*	12	12 (0.09)	5	17 (0.12)	
12/87-5/31/88	148	15	7	22 (0.15)	8	30 (0.20)	7
6/1/88-4/15/89	104	12	●	12 (0.12)	●	12 (0.12)	
	587	53	33	86 (0.15)	18	104 (0.18)	13

* Virus isolation not attempted.
● Serodiagnostic tests not performed.

Table. 4. Results of testing febrile patients at Phebe Hospital, Liberia, for evidence of LV infections, July, 1985 to February,1989.

Hospital/ Dates	No. tested	Lassa Fever			Possible LF (High IFA titers	Total LF & possible LF (Rate)	Other IFA pos.
		Virus isolation	Seroconversion	Total (Rate)			
7/1/85-5/15/86	221#	7#	7	14 (0.07)	2	16 (0.07)	14
5/1/86-9/30/86	62	8	-	8 (0.13)	-	8 (0.13)	1
10/1/86-12/31/86	36	*	-		3	3 (0.08)	2
1/1/87 11/30/8	141	*	6	6 (0.04)	12	18 (0.13)	11
12/1/87-5/30/88	128	26	8	34 (0.27)	3	37 (0.30)	9
6/1/88-2/15/89	112	50	●	50 (0.45)	●	50 (0.45)	
	700	91	21	112 (0.16)	20	132 (0.17)	47

* Virus isolation not attempted.
\# Virus isolation attempted in only 96 of this series.
● Serodiagnostic tests not performed.

Table. 5. Results of testing febrile patients at selected small hospitals in Liberia for evidence of LV infections.

Hospital/ Dates	No. tested	Lassa Fever			Possible LF (High IFA titers	Total LF & possible LF (Rate)	Other IFA pos.
		Virus isolation	Seroconversion	Total (Rate)			
A. Kolahun							
12/87-2/88	10	*	-	-	1	1 (0.10)	1
3 & 4 88	6	-	●	-			
B. ELWA							
	4	*	1	1 (0.25)	-	1 (0.25)	
C. Ganta							
	7	*	-	-	1	1 (0.14)	

* Virus isolation not attempted.
● Serodiagnostic tests not performed.

Table 6. Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	Remarks
CURRAN LUTHERAN HOSPITAL										
Z-1902*	19	F	KeKo	6/30/85	1.3	7/10/85	7/8	4	+	Clinical LF
			YaKo	6/30/85	1.5	7/10/85	7/10	64		Survived
Z-1906*			YaKo	6/30/85	2.5	7/15/85	7/14	-		Fever
			KeKo	6/30/85	1.3	7/15/85	7/15		+	reduced
							7/17	16		
Z-1907*	Ad	F	IrJo	7/1/85	>3.1	7/22/85	7/23		+	Septic AB
			MuSu	7/8/85	1.4	7/22/85			+	Died 7/25
Z-1912	Ch		KeVe	7/24/85	0.9	7/24/85				Discharged in 24 hrs.
Z-1923	Ch	M	YoSe	8/6/85	1.8	8/12/85	8/13	8		Discharged
							8/14	-		6/18
Z-1929*			DaTo	8/6/85	0.7	9/1/85	8/29	-	+	LF. Died
			KeFl	8/6/85	1.3	9/1/85				9/4/85
Z-1976	Ad	M	YaKo	12/2/85	2.5	12/14/85	12/14	-		SGOT 4040
			DaTo	10/7/85	1.1	12/14/85				Died 12/17
Z-2000*	50	F	NoTo	12/3/85	>3.1	2/20/86	2/20	-	+	Preg. LF
			DaJa	12/3/85	0.5	2/20/86	2/21	32		Died 2/22
Z-2009*	6m.	F	BeTo	12/3/85	1.4	3/10/85	3/7	0		Recovered
							3/17	4		
Z-2040	18	M	DaTo	12/3/85	0.6	6/27/86	6/11	-		
			KeMa	12/3/85	>3.1	6/27/86	6/22	-		
Z-2073*	Ad	M	DaTo	12/3/85	0.6	7/18/86			+	Survived
Z-2076	Ad	F	DaJa	12/3/85	0.5	7/22/86				Improved
			BoKa	12/2/85	1.5	7/22/86				in 1 week
Z-2079*	19	F	DaBa	10/5/85	1.4	7/28/86	7/29		+	Survived
			JoKe	10/8/85	1.4	7/28/86	7/31		+	
							8/2		-	
Z-2085	Ad	M	JoKe	10/8/85	1.4	8/7/86				
			DaBa	10/7/85	1.4	8/7/86				

Table 6 (cont.). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				Remarks
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	
Z-2087*	29	F	KeFl	10/8/85	1.7	8/18/86			+	LF. Pregnant
			ErRi	10/7/85	1.0	8/18/86				Survived
Z-2439	28	F	KeMa	3/27/87	1.5	4/17/88	4/7	-	-	
			RaVe	10/23/87		4/17/88				
Z-2440	10d	F	JaMo	10/23/87	0.4	4/17/88	4/15	-		
Z-2675		F	DaSu	2/27/89		3/4/89	4/19		-	
PHEBE HOSPITAL										
P-696		F	ErRi	3/9/85	1.6		8/12	-		Blood culure Pseud.sp
P-771	Ch	F	JoVa	10/19/85	0.6	11/13/85	11/13	-		
							11/14	-		
							11/15	-		
P-798	3+	F	DaTo	3/9/85	1.1	1/11/86	1/4	-		Improved,
							1/14	-		Discharged
						1/22	-			well
P-801	25	F	DaKo	5/10/85	>3.1	1/13/86	1/4	-		Preg. Did
			YaVa	5/10/85	1.2	1/13/86	1/5	-		well. Normal delivery1/17P
P-804*	Ad	F	DaMu	10/19/85	0,2	1/17/86	1/19	32	+	Mild icterus
			OlCo	10/31/85	>3.1					Improved.
P-884	Ad	F	DaSu		0.3	3/19/86	4/3	-		Afebrile 1
			DaDo		0.6	3/19/86	4/4	-		1 day,then
							4/7	-		expired
P-925*	Ad	M	DaMu		0.3	4/23/86			+	Improved
			OlCo		3.1	4/23/86				
P-937	23	F	JoKo	4/24/86	0.5	7/2/86			-	Recovered
			GoCo	4/23/86	2.2	7/2/86				
P-958	Ad	F	DaTo	3/19/86	1.1	8/2/86			-	Improved

Table 6 (cont.). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				Remarks
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	
P-961	Ad	M	DaMu	8/9/86	0.0	8/9/86	8/9	-	-	Improved
			DaMu	8/9/86	0.0	8/9/86				
P-973*	Ad	M	KeMu	8/13/86		9/1/86			+	Recovered
			SaKw	9/1/86		9/1/86				
P-991	Ad	F	GoCo	9/15/86	2.2	9/23/86				Pregnant
			DaTo	9/9/86	1.1	9/23/86				Expired
P-1000	3	M	DaTo	9/9/86	1.1	?				
P-1049	Ad	M	Ma--	1/24/87		1/24/87				
P-1063	Ad	M	BeMu	1/24/87						Expired
P-1066	Ad	F	SaPa	1/6/87	0.3	1/6/87				
P-1074	Ad	M	ElYa	1/13/87		1/13/87				Improved
P-1075*	Ad	M	CaFa	1/13/87		1/14/87	1/13	1048		Died 2nd.
			KeMu	1/14/87		1/14/87	1/15	1048		day
P-1080	Ad	F	JoPe	1/22/87		1/22/87	1/21	-		Improved
			BeMu	1/22/87		1/22/87				
P-1093	AD	F	JoVa	2/6/87		2/6/87	2/4	-		Fever 7 days
			MuKe	2/6/87		2/7/87	2/6	-		Chloramphen icol added, improved
P-1106	Ad	F	MaZa	3/24/87	0.8	4/3/87	4/2	-		Improved
			DaDo	3/24/87	0.4	4/3/87	4/5	-		
P-1107	Ad	F	JaMu	2/19/87	0.3	2/21/87				Improved
			MaKe	2/1/87		2/21/87				
P-1110	7	F				3/3/87				Blood cul- ture neg. Disc after 2 weeks.Prob. typhoid.

Table 6 (cont.). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	Remarks
P-1121	Ch	F	JaMo	3/26/87		3/31/87	3/31	-		Fever down Blood Culture neg.
P-1134	Ad	F	DaDo DaJa	3/24/87 3/24/87		4/7/87	4/6	-		Fever continued few d.
P-1140*	Ad	M	DaDo?	3/24/87		4/12/87 4/12/87	4/12 4/13	- 32		Imp. dramatically post treatment.
P-1142	Ad	F	JaMo JoMi	3/28/87 4/5/87	 0.5	4/17	4/16	-		Afebrile after infusion.
P-1170	Ad	F	DaSu	4/30/87	0.2	5/21/87	5/21	-		Pregnant Non-viable conception Disc. well
P-1201*	Ad	F	MaFa SaPa	1/22/87 1/23/87	 0.3	7/22/87 7/22/87	7/22	256		Dead fetus Vag. bleed, fever, shock D.3hrs post infusion.
P-1216	AD	F	JoMe MuKe	6/22/87 6/22/87		8/9/87 8/9/87				Improved 4 days post infusion.
P-1226	Ch	M	JoKo JoMi	6/22/87 6/22/87	0.2 0.3	8/27/87 8/27/87	8/28 8/31	- -		Icteric. Improved 24 hrs post infusion.
P-1228		F	MuKe MaFa	6/22/87 6/23/87			9/1 9/4	- -		Post-partum bleed. Imp.
P-1231	9 m	M	GoCo	6/23/87	2.2	2/9/87	9/9	-		Improved
P-1249	Ad	F	KeMu	7/5/87		10/5/87 10/7/87	10/5 10/7	- -		Expired
P-1258	Ad	F	JoVa			10/21/87	10/22	-		Expired

Table 6 (cont.). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	Remarks
P-1273*	Ad	F	DaJa	7/17/87	0.2	7/18/87	11/15	32		Afebrile for
			DaTo	7/16/87			11/20	128		few h., then worse, ex-
										pired 4 days
P-1278	Ad	F	RaVe	7/17/87		11/17/87	11/20	-		Post AB &
			DaTo	7/16/87		11/17/87	11/25	-		septic.Rec
P-1285	Ad	F	SaPa	6/22/87	0.2	12/3/87	12/7	-		Recovered
			EsKn	7/16/87		12/3/87	12/8	-		
P-1297	Ad	M	BeVa	11/30/87		1/8/87	1/8/		-	Improved
			MaTa	11/10/87		1/8/87				
P-1298	Ad	F	YaBe	12/1/87		1/10/87	1/4		-	Discharged
			RaVe	12/1/87		1/10/87				
P-1299	Ad	F	DaTo	12/1/87		1/8/87	1/8		-	Renal fail-
			RaVe	12/1/87		1/10/87				ure,edema.
										Expired.
P-1300*		F	RaVe	7/17/87		1/11/88	12/11	1024	-	Fever.Imp.
P-1301	Ad	F	MuKe	11/10/87		1/19/88	1/5		-	Hearing loss
			YaBu	12/1/87		1/19/87				
P-1308*	Ch	M	ITa	1/27/88		1/27/88	1/26	8	+	Improved.
							1/29	8	+	
P-1312*	Ad	F	CaFa	1/29/88		1/29/88	2/2		+	Expired
			MuKe	1/29/88	0.3	1/29/88				
P-1313*	Ad	F	CaFa	1/29/88		1/30/88	2/1	-	-	Recovered
			MuKe	1/29/88		1/30/88	2/10	512	-	
P-1328	Ad	F	MaFa	2/13/88		2/13/88	2/13			Improved
			DaMu	2/13/88		2/13/88				
P-1348	Ad	F	BeVa	2/22/88		3/9/88				Improved
			EsFa	2/23/88		3/3/88				
P-1353*	Ad	F	DaMu	3/2/88		3/16/88	3/15		+	Recovered
			DaTo	2/22/88		3/16/88				

Table 6 (cont). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	Remarks
P-1355	Ad	F	EsKn	2/23/88		3/18/88	3/18		-	Preg. Fever
			YaBa	2/24/88		3/18/88	3/21	-	-	fell but confused. Left hospital
P-1358		M	YaBo	2/24/88		3/28/88	3/28	-	-	Blood Culture neg . Improved
							3/31	-	-	
P-1363	Ad	F	OlCo	3/1/88		4/7/88	3/29	-		Pregnant
			JoMi	3/1/88		4/7/88	4/7	-	-	Improved
P-1394*	Ad	F	JaBa	4/16/88		5/19/88	5/19	-	+	Improved
			OlCo	4/16/88		5/19/88	5/23	8		
P-1400	Ad	F	SaPa	4/15/88		5/23/88	5/20	64	-	Exp 2 d p
			JoMe	4/15/88		5/23/88	5/23	64	-	infusion
P-1405*	Ad	F	JoMe	?		5/30/88	5/28		+	Improved
			SaPa	?		5/30/88				
P-1413*	Ad	M	KoMa	4/12/88		6/15/88	6/15		+	Sl imp.
			BeVa	4/12/88		6/15/88	6/20		-	Discharged
P-1414	Ad	F	DaMu	4/15/88		6/16/88	6/16		-	Improved
P-1426	Ad	F	KoKo	6/15/88		7/12/88	7/12		-	Imp. p. infusion.Died 7/14.
			JaDa	6/15/88		7/12/88				
P-1427*	9y	M	JaFa	6/15/88		7/16/88	7/10		+	Improved
			JoTo	6/15/88		7/16/88				
P-1428	18	M	HeSu	6/15/88		7/17/88	7/11		-	Imp 24h. Disc 2 d.
			AnKo	6/16/88						
P-1430*		F	JoMi	6/15/88		7/12/88			+	Improved
			DaMu	6/16/88						
P-1436*	Ad	M	Illegible			7/18/88	?		+	Resp.distress. D.12 hrs
							?		+	

Table 6. (cont.) Patients treated with LFIP imots om L:iberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

P-1439	32	F	JaFa JoKo	6/15/88 7/18/88	7/19/88 7/19/88	?	-	Improvedd
P-1459*	25	F	MaVa same	9/13/88 9/13/88		?	+	Improved
P-1453	Ad	F	MaFa YaBu	7/26/88 6/7/88	7/26/88 7/26/88	?	-	Improved
P-1455*	Ch	M	JoMi	9/23/88	9/23/88	9/23 ?	+ -	Discharged well.
P-1456	Ad	F	DaJa	6/7/88	9/6/88	9/5	-	Improved
P-1460	Ad	F	JoKo JoKo	9/13/88 9/13/88	9/13/88 9/13/88			Fever to 9/14. Disc 9/19
P-1465*	44	M	MaFa JoTo	9/21/88 9/19/88	9/21/88 9/21/88	?	+	Improved
P-1469	Ad	F	DaMu DaMu	10/15/88 10/15/88	10/15/88 10/15/88	?	-	Improved
P-1471	18	F	JaFa JaFa	10/25/88 10/25/88	10/25/88 10/25/88		-	Improved
P-1477	38	M	SaPa SaPa	10/23/88 10/23/88	10/23/88 10/23/88	?	-	Fever 72 h Disc imp.
P-1478	3y	M	DaJa	5/7/88	10/12/88	?	-	Improved
P-1486	17y	M	MaTu MaTu	11/17/88 11/17/88	11/18/88 11/18/88			Improved immediately.
P-1492	Ad	F	JKMi JKMi	12/2/88 12/2/88	12/2/88 12/2/88			Inc AB. Fever down, but died in 3 d.
P-1494*	Ad	M	SaPa JoTo	1/6/89 1/19/89	1/19/89 1/19/89	?	+	Improved
P-1495*	Ad	F	JoTo	1/19/89	1/19/89	?	+	Improved
P-1497	Ad	M	JaFa JaFa	1/23/89 1/23/89	1/23/89 1/23/89	?	-	Improved

Table 6 (cont). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	Remarks
P-1523*	Ad	F	DaMu	1/7/89			?		+	Improved
			SaPa	1/6/89						Disc, 2 d
P-1529*	15	M	YoMc	2/7/89		2/7/89	2/7		+	Disc 7 d. Lo fever
P-1530*	19	M	GaAb	2/7/89		2/9/89	2/7		+	Improved
			HeSu	2/9/89		2/9/89				
P-1534*	Ad	F	DaMu	2/10/89		2/12/89	2/10		+	Cont ill
			DaMu	2/12/89		2/12/89				3d. Imp.
P-1537	Ad	F	JoMi	2/10/89		2/10/89	?		-	Improved
			JoMi	2/10/89		2/10/89				
P-1541	Ad	F	JoKo	2/14/89		2/14/89	2/12		-	Improved
			JoKo	2/14/89		2/14/89	2/16		-	
P-1543*	7y	M	MaFa	2/15/89		2/15/89	2/15		+	Improved
P-1544*	Ad	F	AnKo	2/17/89		2/17/89	2/16		+	Pregnant.
			AnKo	2/17/89		2/17/89				Expired
P-1551*	Ad	F	EBa	2/21/89		2/21/89	?		+	Improved
			EBa	2/21/89		2/21/89				
P-1556*	Ad	F	AlSa	2/28/89		2/28/89	2/28		+	Pregnant
			AlSa	2/28/89		2/28/89				Improved
P-1558*	13y	F	YoMc	2/27/89		2/28/89	2/28		+	Improved
P-1560*	Ad	M	Illegible			2/28/89	2/28		+	Improved
			Illegible			2/28/89				Disc 3/5.
P-1562*	Ad	F	BeMu			2/29/89	2/28		+	Improved
			BeMu			2/29/89				
P-1563	Ch	M	JoTo	3/1/89		3/1/89				Improved
P-1569*	Ad	F	LiWo	3/3/89		3/3/89	3/1		+	Exp 3/10
			LiWo	3/3/89		3/3/89				
P-1572	Ad	F	JoKo	3/1/89		3/1/89				Improved
			JoKo	3/1/89		3/1/89				

Table 6 (cont). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				Remarks
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	
P-1576	Ad	M	ToBo	3/5/89		3/5/89				Improved
			CoBo	3/5/89		3/5/89				
P-1577*	Ad	M	ToBo	3/5/89		3/5/89	3/5		+	Improved
			CoBo	3/5/89						
P-1588	Ad	M	NeSu	3/8/89		3/8/89	3/9		-	Improved
P-1597	Ad	M	DaMu	3/8/89		3/8/89				Improved
&1607			DaMu	3/8/89		3/8/89				
P-1591	Ad	F	CaFa	3/9/89		3/9/89				Died 3/15
			CaFa	3/9/89		3/9/89				
P-1593	Ad	F	JoMi	3/9/89		3/9/89				Improved
			JoMi	3/9/89		3/9/89				
P-1596*	Ad	F	MoKe	3/10/89		3/10/89	3/10		+	Improved
			MaKw	3/10/89		3/10/89				
P-1605	Ad	F	MoKe	3/12/89		3/12/89				Improved
			MaKw	3/12/89		3/12/89				
P-1612	Ad	F	HuTe	3/14/89		3/17/89				Improved
			GoBa	3/16/89		3/17/89				
P-1617	Ad	M	YoHo	3/14/89		3/25/89				Improved
			HaTe	3/14/89		3/25/89				Improved
P-1626*	Ad	F	YoHo	3/26/89		4/5/89	4/6		+	3d. post-partum Bleeding, inj sites. Expired 3d p.infusion
			JoKe	3/31/89		4/5/89				
P-1629	Ad	M	GaAb	4/7/89		4/8/89				Afebrile 2 d. post infusion.Imp.
			EmBa	4/7/89		4/8/89				
P-1633	Ad	F	EmBa	4/7/89		4/8/89				Improved
			GaAs	4/7/89		4/8/89				
P-1804	Ad	F	?			12/28/89				Pregnant Exp. p 2 d.
			?			12/28/89				

Table 6 (cont). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				Remarks
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	
P-1806	Ad	F	?			1/5/90				Expired p.
			?			1/5/90				3 d.
P-1807	Ad	F	DaMu	1/8/90		1/8/90				Fever cont.
			DaMu	1/8/90		1/8/90				5 d.
P-1811	Ad	F	JaMa	1/8/90		2/1/90				Fever 2 d.
			MaFa	1/11/90		2/1/90				p. plasma.
P-1814	Ad	M	JaDa	2/7/90		2/10/90				Afebrile in
			ZiHo	1/18/90		2/10/90				24 hours.
P-1815	AD	M	JaGa	2/7/90		2/11/90				Staph.
			JTKo	2/6/90		2/11/90				septicemia
P-1816	AD	M	MaFa	1/11/90		2/13/90				Afebrile in
			JTKo	2/6/90		2/13/90				24 hrs.
P-1817	AD	F	AlSa	1/22/90		2/14/90				Afebril by
			GeSe	2/14/90		2/14/90				3rd day.
P-1820	AD	M	AlKa	3/1/90		3/1/90				Temp fell in
			ElKe	2/22/90		3/1/90				24 hrs.
P-1821	17y	M	Illegible							Rapidly
			Illegible							improved.
P-1822	5y	F	HaTe	3/1/90		3/4/90				Afebrile in
										2 days.
P-1824	AD	M	AlSa	1/22/90		3/8/90				Afebrile in
			ZiHo	1/18/90		3/8/90				24 hrs.
P-1825	Ad	F	JoKe	12/7/89		3/8/90				Febrile 5 d.
			GeSl	2/14/90		3/8/90				p.plasma
P-1829	Ad	M	ZwHa	3/1/90		3/9/90				Died after
			JaFa	3/7/90		3/9/90				5 d.
P-1830	Ch	M	JaFa	3/7/90		3/9/90				Afebrile in
			GeAb	3/9/90		3/9/90				2 d.
P-1831	AD	M	ElKl	2/22/90		3/10/90				Afebril in
			GeAb	3/9/90		3/10/90				48 hrs.

Table 6 (cont). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

Patient Number	Age	Sex	Donor Information			Recipients Information				Remarks
			Name	Plasma Date	LNI	Infusion Date	Test Date	IFA1	VI/ Titer	
P-1836	AD	F	DaMu	3/23/90		3/23/90				Afebrile
			DaMu	3/23/90		3/23/90				in 24 hrs.
P-1839	AD	M	?			3/26/90				Melena. Exp.
			?			3/26/90				5 da post infusion.
P-1842	Ad	M	JaMu	3/30/90		3/30/90				Afebril in
			JaMu	3/30/90		3/30/90				24 hrs.
P-1845	Ad	M	AlSa	4/2/90		4/2/90				E. hist.?
			AlSa	4/2/90		4/2/90				Fever 5 d.
P-1846	Ad	M	?			4/2/90				Febrile p.2
			?			4/2/90				wks.
P-1846?	Ad	F	?			4/10/90				Imp. after
			?			4/10/90				10 d.
P-1847	Ad	F	?			4/11/90				Imp. 1 wk
			?			4/11/90				
P-1848	Ch	F	SaKw	4/4/90		4/4/90				Afebrile in 1 d.
P-1849	Ch	M	MaKw	4/6/90		4/6/90				Afebrile in 1 d.
P-1850	Ad	F	MaKw	4/6/90		4/6/90				Improved
			GeSl	4/6/90		4/6/90				
P-1851	Ch	M	GlYa	3/20/90		3/20/90				Afebrile in 24 hours.
P-1852	18	F	ElKl	4/8/90		4/8/90				Improved
			ElKl	4/8/90		4/8/90				
P-1853	ad	F	HeKo	4/8/90		4/8/90				Improved
			GeSl	4/6/90		4/8/90				

KEY: See next page.

Table 6 (conc). Patients treated with LFIP units in Liberian Hospitals, July 1985 to April, 1989. See key at end of Table for definition of the column headings.

KEY:

Patient number is that assigned when blood is drawn for testing. An asterisk indicates a laboratory confirmed diagnosis of Lassa Fever or Possible Lassa Fever

Age and sex are self-explanatory.

Donor identified by first two letters of first and last name. At times person filling in the form used idiosyncratic spelling.

Plasma date is that of plasmmapheresis.

LNI is the Log Neutralization Index as determined at USAMRIID. See test for discussion. No entry in this column indicates that the information is not at hand.

Infusion date is the date LFIP was administered.

Test date is that when blood was drawn for serum sample.

IFA Is the reciprocal of the titer of LVA as determined by IFA at the LIBR. An empty column indicates that no report of a test has been received.

VI indicates the result of attempted virus isolation. If virus was not isolated when attempted, this is indicated by "-" (minus). An empty column indicates that no report has been received.

Remarks includes brief comments made in the reporting form.
Abbreviations include:
AB - abortion
d - day or days
Disc - discharged.
Exp - expired
h - hour or hours
Imp - improved
p - after (post)
Preg. - pregnant
w - week or weeks

Table 7. Laboratory confirmation of the clinical diagnosis of Lassa fever among patients treated by plasmapheresis in selected Liberian hospitals, June, 1985 to April, 1990.

	Serology	Virus isolation	Both*	Either Test
Diagnosis:				
Confirmed	11	41	10	48
Not confirmed	32	29	5	50
Total tested	43	70	15	98
Rate: Confirmed/total	.25	.59	.67	.49

* When both techniques were used, in two instances the diagnosis was made by serological tests, in four by virus isolation, and in four by both methods.

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